Patent claims

1. A flame-retardant mixture for lignocellulose composites,

characterized by

- from 60 to 90% by mass of particulate and/or fibrous lignocellulose materials and

- from 40 to 10% by mass of a flame-retardant concentrate immobilized on and/or in the particulate and/or fibrous lignocellulose materials as carriers, with

  from 16 to 60% by mass of flame retardants of the type consisting of boric acids and/or the salts thereof and
  from 16 to 75% by mass of melamine resins,

k = 5

the flame retardant of the type consisting of boric acids and/or the salts thereof being present chemically coupled to the melamine resins, and the flame retardant concentrates being present immobilized on and/or in the carrier substance of the particulate and/or fibrous lignocellulose materials as carriers.

2. The flame-retardant mixture as claimed in claim 1, **characterized in that** the flame retardant concentrate immobilized on and/or in the particulate and/or fibrous lignocellulose materials as carriers furthermore comprises up to 50% by mass of synergistic agents and/or 25% by mass of further additives.

3. The flame-retardant mixture as claimed in claim 1 or 2, **characterized in that** the particulate and/or fibrous lignocellulose materials

are chips, fibers and/or granular particles of softwoods and/or hardwoods, regenerated cellulose fibers, paper fibers, cotton fibers and/or bast fibers of flax, hemp, jute, ramie, sisal or kenaf.

4. The flame-retardant mixture as claimed in at least one of claims 1 to 3, **characterized in that** the melamine resins are polycondensates partly or completely etherified with C_1-C_{18}-monoalcohols, dialcohols and/or polyalcohols and comprising melamine and C_1-C_8-aldehydes, preferably comprising melamine and formaldehyde.

5. The flame-retardant mixture as claimed in at least one of the preceding claims, **characterized in that** the melamine resins are relatively high molecular weight melamine resin ethers having number average molar masses of from 500 to 50 000.

6. The flame-retardant mixture as claimed in at least one of the preceding claims, **characterized in that** the flame retardants of the type consisting of boric acids and/or the salts thereof are boric acid, metaboric acid, sodium tetraborate, sodium octaborate and/or ammonium pentaborate, the molar B_2O_3:Na_2O ratio being from 1:0 to 2:1.

7. The flame-retardant mixture as claimed in at least one of the preceding claims, **characterized in that** the synergistic agents are urea, melamine, melamine cyanurate, unetherified melamine resin precondensates, partly etherified melamine resin precondensates, cyanuric acid and/or phosphorus salts of the type consisting of sodium phosphates, monoammonium phosphates and/or ammonium polyphosphates, the proportion of the phosphorus salts being from 0 to 60% by mass, based on the overall sum of the synergistic agents.

8. The flame-retardant mixture as claimed in at least one of the preceding claims, **characterized in that** the further additives

are water repellants, impregnating auxiliaries and/or immobilizing auxiliaries for flame retardants.

9. A process for the production of a flame-retardant lignocellulose composite comprising a flame-retardant mixture as claimed in at least one of claims 1 to 8,

characterized in that

the composite is produced by a liquid impregnation process in which the particulate and/or fibrous lignocellulose materials are impregnated with solutions or dispersions of flame retardants of the type consisting of boric acids and/or the salts thereof at temperatures of from 20 to 90°C by spraying or immersion, and the particulate and/or fibrous lignocellulose materials impregnated with flame retardant concentrates are dried at from 55 to 170°C with partial curing of the melamine resins.

10. The process as claimed in claim 9, **characterized in that** the particulate and/or fibrous lignocellulose materials are impregnated with solutions of melamine resins in water, C_1-C_8-alcohols or mixtures of from 10 to 90% by mass of water and from 90 to 10% by mass of from C_1-C_8-alcohols, having a solids content of melamine resins of from 10 to 60% by mass, which solutions contain the flame retardants of the type consisting of boric acids and/or the salts thereof and optionally synergistic agents in dissolved or dispersed form.

11. The process as claimed in claim 9, **characterized in that** the particulate and/or fibrous lignocellulose materials are impregnated with solutions or dispersions of the synergistic agents and subsequently with solutions of melamine resins in water, C_1-C_8-alcohols or mixtures of from 10 to 90% by mass of water and from 90 to 10% by mass of C_1-C_8-alcohols, having a

solids content of melamine resins of from 10 to 60% by mass, which solutions contain the flame retardants of the type consisting of boric acids and/or the salts thereof in dissolved or dispersed form.

12. The process as claimed in claim 9, **characterized in that** the particulate and/or fibrous lignocellulose materials are impregnated with solutions or dispersions of the flame retardants and of the synergistic agents and subsequently with solutions of melamine resins in water, C_1-C_8-alcohols or mixtures of from 10 to 90% by mass of water and from 90 to 10% by mass of C_1-C_8-alcohols, having a solids content of melamine resins of from 10 to 60% by mass.

13. The process as claimed in claim 9, **characterized in that** the particulate and/or fibrous lignocellulose materials are impregnated with solutions or dispersions of the flame retardants and of the synergistic agents and subsequently with solutions of melamine resins in water, C_1-C_8-alcohols or mixtures of from 10 to 90% by mass of water and from 90 to 10% by mass of C_1-C_8-alcohols having a solids content of melamine resins of from 10 to 60% by mass.

14. The process as claimed in claim 9, **characterized in that** the particulate and/or fibrous lignocellulose materials are impregnated with solutions of melamine resins in water, C_1-C_8-alcohols or mixtures of from 10 to 90% by mass of water and from 90 to 10% by mass of C_1-C_8-alcohols, having a solids content of melamine resins of from 10 to 60% by mass, and subsequently with solutions of the flame retardants of the type consisting of boric acids and/or the salts thereof.

15. The process as claimed in claim 9, **characterized in that** the particulate and/or fibrous lignocellulose materials are impregnated with solutions of the flame retardants of the type consisting of boric acids and/or the salts thereof, subsequently with solutions or dispersions of the synergistic agents and

subsequently with solutions of melamine resins in water, C_1-C_8-alcohols or mixtures of from 10 to 90% by mass of water and from 90 to 10% by mass of C_1-C_8-alcohols, having a solids content of melamine resins of from 10 to 60% by mass.

16. The process as claimed in at least one of claims 9 to 15, **characterized in that** the further additives are added to the melamine resins, to the flame retardants of the type consisting of boric acids and/or the salts thereof and/or to the synergistic agents.

17. The process for the production of a flame-retardant lignocellulose composite comprising a flame-retardant mixture as claimed in at least one of claims 1 to 8,

characterized in that

the flame-retardant mixture is prepared by a melt impregnation process in which flame retardants are dispersed and partly dissolved in melts of melamine resins at from 35 to 130°C and subsequently the particulate and/or fibrous lignocellulose materials are dispersed in the mixtures and impregnated with the melt of said mixtures,

partial curing of the melamine resin taking place as a result of a temperature increase to 90 to 170°C and further additives being added to the melamine resins, to the flame retardants of the type consisting of boric acids and/or the salts thereof and/or to the synergistic agents.

18. The process as claimed in claim 17, **characterized in that**, in the melt impregnation process, in addition to the flame retardants of the type consisting of boric acids and/or the salts thereof and also synergistic

agents are dispersed and partly dissolved in the melts of melamine resins at from 35 to 130°C.

19. A process using a flame-retardant mixture as claimed in at least one of claims 1 to 8,

characterized in that

the composite is produced by a liquid impregnation/solids mixing process in which the particulate and/or fibrous lignocellulose materials are impregnated with solutions or dispersions of flame retardants of the type consisting of boric acids and/or the salts thereof at temperatures of from 20 to 90°C by spraying or immersion, and the impregnated particulate and/or fibrous lignocellulose materials are dried.

20. The process as claimed in claim 19, **characterized in that** the particulate and/or fibrous lignocellulose materials are impregnated with solutions of melamine resins in water, C_1-C_8-alcohols or mixtures of from 10 to 90% by mass of water and from 90 to 10% by mass of C_1-C_8-alcohols, having a solids content of melamine resins of from 10 to 60% by mass, and simultaneously or subsequently with solutions of the flame retardants of the type consisting of boric acids and/or the salts thereof at temperatures of from 20 to 90°C, the impregnated particulate and/or fibrous lignocellulose materials are dried at from 55 to 170°C with partial curing of the melamine resins, and synergistic agents are mixed as solids with the impregnated particulate and/or fibrous lignocellulose materials.

21. The process as claimed in claim 19, **characterized in that** the particulate and/or fibrous lignocellulose materials

are impregnated with solutions of the flame retardants of the type consisting of boric acids and/or the salts thereof at temperatures of from 20 to 90°C, the impregnated particulate and/or fibrous lignocellulose materials are dried at from 55 to 170°C, and synergistic agents and melamine resins are mixed as solids with the impregnated particulate and/or fibrous lignocellulose materials.

22. The process as claimed in claim 19, **characterized in that** the particulate and/or fibrous lignocellulose materials are impregnated with solutions and/or dispersions of the flame retardants of the type consisting of boric acids and/or the salts thereof and synergistic agents at temperatures of from 20 to 90°C, the impregnated particulate and/or fibrous lignocellulose materials are dried at from 55 to 170°C, and melamine resins are mixed as solids with the impregnated particulate and/or fibrous lignocellulose materials.

23. The process as claimed in at least one of claims 19 to 22, **characterized in that** the further additives are added to the melamine resins, to the flame retardants of the type consisting of boric acids and/or the salts thereof and/or to the synergistic agents.

24. A molding material for the production of flameproofed lignocelluose composites,

prepared by

dry premixing of the components

- from 40 to 95% by mass of flame-retardant mixture as claimed in at least one of claims 1 to 8,

- from 5 to 60% by mass of thermosetting prepolymers of the type consisting of phenol resins, urea resins, melamine resins, guanidine resins, cyanamide resins and/or aniline resins and
- from 0.1 to 10% by mass of processing auxiliaries and/or auxiliaries,

and granulation.

25. The molding material as claimed in claim 24, **characterized in that** the preparation is effected by melt compounding at from 100 to 170°C and granulation following the dry premixing of the components.

26. A flameproofed lignocellulose composite, **produced by** extrusion, injection molding or pressing of the molding materials as claimed in claim 24 or 25 and curing.

27. The use of the lignocellulose composites as claimed in claim 26 as flame-retardant semifinished products and molding materials for applications in outdoor use in the building and leisure sector.